Seiji MORIYA, Tamagaw University, Tokyo

On the Pre-service of Mathematics Education for Elementary School Teachers at the University of Education(2)

I would like to explain my concrete plans on the pre-service of mathematics education at the University of Education. The contents of my lecture are: history, recognition, methods and contents for mathematics education. These contents were taught by mathematical activities.

1. Introduction

I think that there are two big problems to be solved on teacher training in university of education in Japan. The first problem is a marked decline in the students' scholastic performance in university. The second problem is a decrease of a required or an elective subjects of mathematics education in curriculum of university of education. We can expect that teacher's ability of mathematics education in elementary school will decrease in the future. So, I would like to report on concrete plan to solve these problems in classroom of mathematic education in university. At first I would like to explain school system and teacher training of Japan. We have adopted liner school system, as 6,3,3,4 since 1947. Fig.1 is school hours of mathematics par a week in elementary school, junior high school and high school.

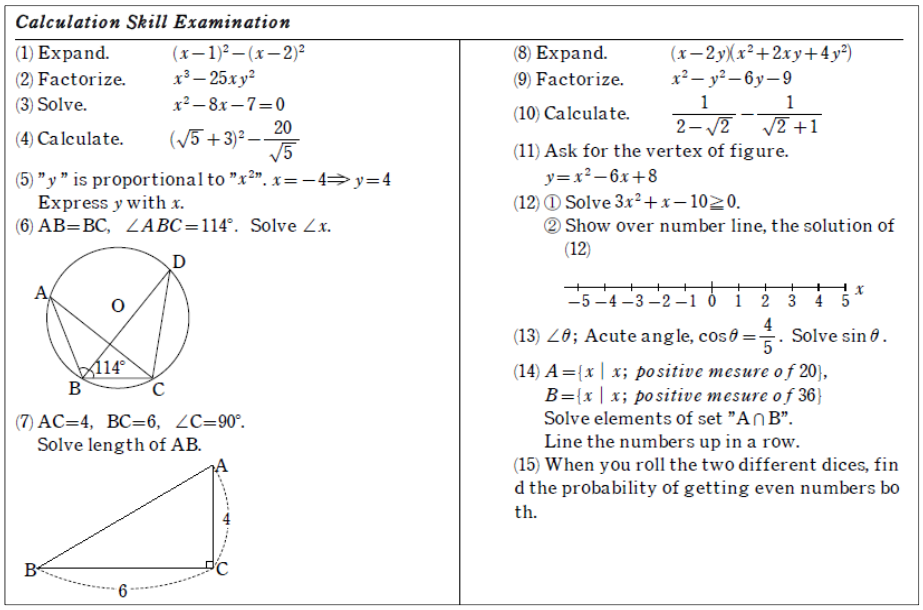
	primary school						Junior high school			High school		
age(Apr.)	6	7	8	9	10	11	12	13	14	15	16	17
Grade	1	2	3	4	5	6	1	2	3	1	2	3
Hour	4	5	5	5	5	5	4	3	4	I 3	II 4	III 5
										A 2	B 2	Apl. 2
	45minutes/h						50minutes/h					

Fig.1 School hours of mathematics par a week in Japan

School teachers generally have degree of Bachelor. Teachers who take a degree of master are recently increasing. Students take a license of teacher at university and a graduate school. The education committee of prefecture or big city employs teachers for public schools by the examination.

2. Two problems in mathematics education in university of educationat

Questionnaires on Fig.2 is mathematical problems to examine academic ability of universities students who hope to become to be elementary school teachers(T.Kawasaki and three others, 2012). The contents of these problems is the level of 10th grade. All students have studied them and passed an exam in a high school. Result is Fig.3. Teachers are trained at a faculty of education in national universities, a faculty of education in private universities and university by correspondence.



Calculation Skill Examination

(1) Expand. $(x-1)^2-(x-2)^2$

(2) Factorize. x^3-25xy^2

(3) Solve. $x^2-8x-7=0$

(4) Calculate. $(\sqrt{5}+3)^2-\dfrac{20}{\sqrt{5}}$

(5) "y" is proportional to "x^2". $x=-4 \Rightarrow y=4$
Express y with x.

(6) AB=BC, $\angle ABC=114°$. Solve $\angle x$.

(7) AC=4, BC=6, $\angle C=90°$.
Solve length of AB.

(8) Expand. $(x-2y)(x^2+2xy+4y^2)$

(9) Factorize. x^2-y^2-6y-9

(10) Calculate. $\dfrac{1}{2-\sqrt{2}}-\dfrac{1}{\sqrt{2}+1}$

(11) Ask for the vertex of figure.
$y=x^2-6x+8$

(12) ① Solve $3x^2+x-10 \geqq 0$.
② Show over number line, the solution of (12)

(13) $\angle\theta$; Acute angle, $\cos\theta=\dfrac{4}{5}$. Solve $\sin\theta$.

(14) $A=\{x \mid x;\ positive\ mesure\ of\ 20\}$,
$B=\{x \mid x;\ positive\ mesure\ of\ 36\}$
Solve elements of set "A∩B".
Line the numbers up in a row.

(15) When you roll the two different dices, find the probability of getting even numbers both.

Fig.2 The basis skill

But, mathematical ability of students is different with universities. We find that ability of the private university's students is lower than one of the national university for calculation ski and mathematical skill. Moreover, distribution of Ability of students by correspondence without the entrance examination have two peaks, as low level and high level. Students of private university who hope to become to be elementary school teacher didn't understand contents of matimatics of 10th level in high school.

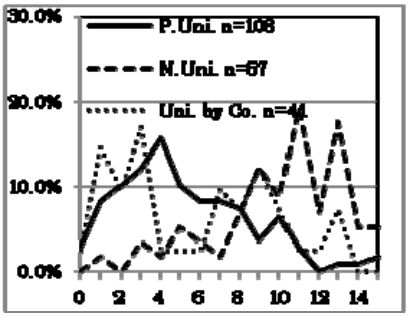


Fig.3 Results

Fig.4 is curriculum of mathematics education and mathematics for elementary school teacher's course in university of education. We find one subject of mathematics education for 4 years of university on this table. On 1976 students studied 2 subjects, but students study only one subject now. There are 15×90min. in a semester. There is only this classroom in teacher training's curriculum to study mathematics education of elementary school ! It is difficult for students to become to be good teacher about mathematics, because their ability is lower than before and there is not enough contents of mathematics education in university

2010			1976
Req.	Math.Edu.	1 subject	2
	Math.	0	2
Opt.	Math.Edu.	0	7
	Math.	1	2

Fig.4 Curriculum of math. edu. and math. in university

3. My Concrete plans

Purposes of teaching in my classroom are that students understand Japanese history of mathematics education since the world war Ⅱ, they analyze educational problems of mathematics Education in Japan and they acquir how to study and how to develop teaching materials of mathematics education

Teaching methods are that they review mathematical contents of 10th grade school book of high school, they learn on teaching material of mathematics education of elementary school through mathematical activities and I focus mathematics connected students' daily lives

It is necessary for us to teach the following four themes to students in a class for mathematics education. These contents provide students the fundamental knowledge which allows a teacher to understand the contents of mathematics, and to develop teaching materials. Then they will be able to teach them very well.

1) The history of mathematics education.

Mathematics education have many problems to solve. Students can research the solution method of problems if they know historical processes of these problems. In Japan, a core-curriculum called "unit learning" was enforced from 1947 to about 1955. But Unit learning was stopped in 1956 because students' mathematical ability decreased. This Unit learning is similar to the "synthetic learning" executed from 2000. Theys need to study the similarities of learning of two types. And they must take care to avoid a decrease of academic ability of pupils.

2) Recognizable contents

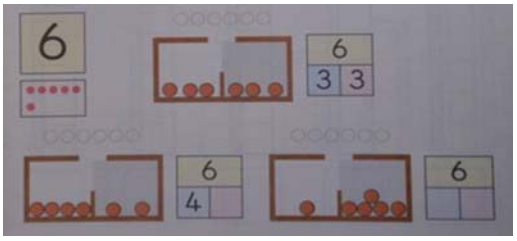


Fig.5

Fig.6

Because mathematics education starts from under the age of one, at first students need to study preschool education. Next, they underatand on cognition of pupils and they must develop teaching tools. For example, Fig.5 is school book of 1st grade of elementary school of Japan to learn decomposition and composition of numbers. But, this method is not good, because pupils can watch two rooms and they finish solving by counting balls without mental thinking. So, it is important that one room is hidden to

think numbers. Students make teaching tools for this theme by themselves. And they learn how to use this tool (Fig.6).

3) Educational methods and the usage of information technology

They specially study for distance learning by using a teleconference system. Fig.7 is scene of distance learning between two classrooms at the 5st grade of elementary school. Students study the usage of information technology.

Fig.7 Teleconference

4) Educational contents

Students must study the relationship between mathematics and our daily life and culture, too.

I present on curved line and curvature, as a example of contents. Students approximate a curved line by the arcs(Fig.8). And they obtain the length of the curved line by calculating the total of the lengths of some arcs(Fig.9). Final, they make pictures. they measur surroundings of patterns and affix the woolen yarn to it(Fig.10). The picture includes using differentiable continuous curve and not differentiable continuous curve with cusp.

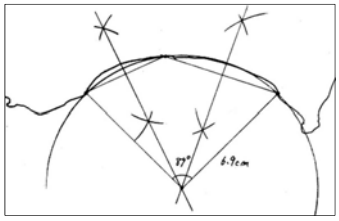


Fig.8 Review

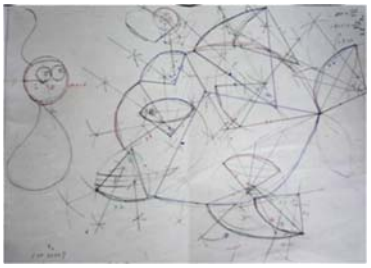


Fig.9 Application

Fig.10 Work

4. Conclusion

In this paper I have explained problems, my concrete plan on the pre-service of mathematics education at the University of Education. I think we need to teach students mathematics education at least for one year in order to develop their experience and to study some theories for mathematics education.

Reference

T.Kawasaki, S.Moriya,Y.Okabe,T.Maesako (2012): The Problems of Mathematical Modelling Introduction on Mathematics Education in Japanese School, Journal of Mathematical Modelling and Application , 2012 Vol.1, No 5,50-58